TECHNICAL NOTES

U. S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

IOWA STATE OFFICE
DES MOINES, IOWA

Agronomy #34

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Subject: PASTURE AND HAYLAND PLANTING

This technical note provides basic information on planting forages for pasture and hayland. It will review species selection, seeding rates, seeding dates, crop use information, seedbed preparation, seeding stand improvement and weed control. Much of this information will be presented in table format.

Seeding dates are shown in Table 1. They are based upon long-term averages and may be extended two weeks by the District Conservationist. While seeding outside of these time frames has been successful, research and experience has shown seeding completed within these time frames has a better chance of success. Extension of the deadlines shall be based upon both favorable moisture and temperature for seed germination.

Table 1. Seeding dates for introduced species, native species and annuals

Type of Seeding	Introduced Species[2] (Grasses and Legumes)	Native Species[3] (Includes Prairie Restoration Mixtures)
Spring	March 1 - May 15	April 1 - June 1
Late Summer	August 1 - September 15	Not Recommended
Dormant	November 15 - Freeze-up	November 15 - Freeze-up
Frost[1]	February 1 - March 15	February 1 - March 15

1 - Refer to Table 2 for applicable plant species.
2 - Includes all species generally considered introduced.
3 - Includes all warm and cool season natives when planted in mixture.

Seeding into the best possible environment increases the chances for a successful seeding. Applying fertilizer and lime according to a soil test is recommended. Refer to Nutrient Management Standard 590 for fertilizer and lime recommendations for pasture and hayland seeding establishment and management. If legumes are a part of the seeding mixture soil pH is very important. Legume seed needs to be inoculated. Refer to *Agronomy Technical Note #11 Legume Inoculation* for more specific guidance.

Species selection should be determined primarily upon the intended use and it's tolerance to environmental hazards. Tables 2 and 3 provide guidance for species selection.

Table 2. Crop Use Information (E=excellent, G=good, F=fair, P=poor).

	Annual or			Pasture (Grazing)		
CROP	Perennial	HAY	Silage	Continuous	Controlled	Palatability
LEGUMES						
Alfalfa	Perennial	E	E	P	E	E
Alsike clover	Short-lived perennial	G	G	P	G	E
Birdsfoot trefoil	Perennial	G	E	G	G	G
Crownvetch	Perennial	F	G	F	G	G-F
Kura clover	Perennial	G	G	E	E	E-G
Lespedeza (Korean)	Annual	F	F	F	F	G
White (Ladino) clover	Perennial	F-P	F-P	E	E	E
Medium red clover	Short-lived perennial	G	E	P	G	E
Sweet clover	Biennial	F-P	G	P	F	F
INTRODUCED GRASSES						
Intermediate wheatgrass	Perennial	G	G	P	F	F
Kentucky bluegrass	Perennial	F-P	F-P	E	E	E
Orchardgrass	Perennial	E	G	E	E	G
Perennial ryegrass	Short-lived perennial	E	E	E	G	E
Red top	Perennial	F	F	F	F	G
Reed canarygrass	Perennial	G	G	F	G	G
Smooth bromegrass	Perennial	E	E	F	E	E
Tall fescue	Perennial	G	G	G	G	G
Timothy	Perennial	E	E	F	G	G
NATIVE GRASSES						
Big bluestem	Perennial	F	F	F	G	G
Canada wildrye, short lived	Perennial	F	F	P	F	F
Eastern gamagrass	Perennial	G	G	F	G	E
Indiangrass	Perennial	F	F	F	G	G
Little bluestem	Perennial	F	F	P	F	F
Sideoats grama	Perennial	F	F	P	G	G
Switchgrass	Perennial	G	F	F	G	G
ANNUAL GRASSES						
Pearl Millet	Annual	F	F	F	G	G-F
Sorghum-Sudangrass	Annual	P	G	F	G	G-F
Sudangrass	Annual	P	F	F	G	G-F

Table 3. Crop description, relative tolerance of established forages to environmental hazards, and ease of establishment (E=excellent, G=good, F=Fair, P=poor).

CROP	Cold Frost	Soil Drought	Wetness	Acidity	Ease of Establishment	Growth Habit	Palatability	Anti-Quality Component
LEGUMES								
Alfalfa[1]	G	G	P	P	G-E	T	E	B
Alsike clover	F	P	G	G	F	M	E	B, P
Birdsfoot trefoil[1]	G	F	G	G	P	M-S	G	T
Crownvetch	G	G	P	E	P	T	G-F	G
Kura clover	E	F	F	F	P	M-S	E	B
Lespedeza (Korean)[2]	P	G	P	F	G	S	G	T
White (Ladino) clover	F	P	G	F	F	S	E	B
Medium red clover	G	F	F	F	G-E	M	E	B
Sweet clover	G	G	P	P	F	T	F	B, C
INTRODUCED GRASSES								
Intermediate wheatgrass[6]	E	G	P	F	F	T	G	---
Kentucky bluegrass	E	P	G	F	P	S	E	---
Orchardgrass	F	F	F	F	G-E	M-S	G	---
Perennial ryegrass[3, 4, 5]	P	P	G	F	E	M-S	E	E
Red top	E	G	G-E	E	F	S	G-F	---
Reed canarygrass[4]	E	G	E	G	P	T	G-P	A
Smooth bromegrass	E	G	F	F	F	T-M	E	---
Tall fescue[5]	G	G	G	E	G	T-M	F-G	A, ET
Timothy	G	P	P	G	F	M-T	E	---
NATIVE GRASSES								
Big bluestem[7]	G	E	P	G	P	T	G	---
Canada wildrye	G	F	---	---	G	T	F	---
Eastern gamagrass	G	E	F-G	G	P	T	E	---
Indiangrass[7]	F	E	F	G	P	T	G	---
Little bluestem[7]	G	E	F-P	G	P	M	F	---
Sideoats grama[7]	G	E	P	G	P	M	G	---
Switchgrass[7]	G	E	G	G	F	T	G	---
ANNUAL GRASSES								
Annual Ryegrass	P	P	G	F	E	M-S	G	---
Foxtail/German Millet	P	G	F	F	E	T	F	---
Hyb Pearl Millets	P	G	P	F	G	T	G	---
SorghumXSudan	P	E	P	F	E	T	F	CG
Sudangrass	P	E	P	F	E	T	F	CG
OTHER								
Rape	E	F	F	F	G	S	G	P
Turnips	E	F	F	F	G	S	G	P
Chicory	F	F	F	G	G	S	G	---

See footnotes on next page.

Growth Habit: T = Tall M = Moderate S = Short	
Anti-quality components:	**Footnotes:**
A = Alkaloids (decrease palatability)	1. Select erect varieties for hay and prostrate
B = Bloat potential	varieties for pasture.
C = Coumarin (hemorrhagic agent, formed during spoilage of hay)	2. Limited to extreme southern Iowa, must be.
CG = Cyanogenic Glycosides (may form hydrogen cyanide – HCN poisoning; also Prussic Acid Poinsoning	allowed to mature and reseed a stand for the next
ET = Endophyte Toxicity (reduce blood circulation to appendages "dry gangrene")	Year.
G = Glycosides (decrease palatability)	3. Select the more winter hardy varieties for use
P = Photosensitization (sunburn on animals with light colored hair, reduce animal performance)	In Iowa.
T = Tannins (decrease palatability)	4. Select the low-alkaloid varieties to improve palatability.
	5. Select the endophyte-free varieties to improve Animal performance.
	6. Only recommended for western one-half of Iowa at this time.
	7. Select a variety that is adapted to the appropriate MLRA. See Table 5 of the 327 Standard for recommended varieties.

Seedings can consist of a single species or a mixture of species. In either situation the selection needs to be based upon the following:

1. Climatic conditions such as annual rainfall, seasonal rainfall, growing season length, humidity levels, temperature extremes and the USDA Plant Hardiness Zones.
2. Soil condition and position attributes such as pH, percent slope, available water holding capacity, aspect, drainage class, inherent fertility, flooding and ponding, and levels of salinity and alkalinity.
3. Plant characteristics such as season of growth, vigor, ease of establishment, longevity of the species, growth habit, adaptation to soil conditions, and conservation value.
4. Resistance to diseases and insects common to the site or location.
5. Compatibility with other plant species and their selected cultivars in rate of establishment and growth habit when seeded together as a mixture.

In general, prepared mixes offered by many seed companies should not be used. They often include species that may not be as desirable for the intended use. Many times these prepared mixes include species that will not remain as a viable component of the forage stand for more than a couple of years. A producer can get a mixture better adapted to the site and more suitable for his/her needs if they use the information included in Tables 2 & 3 to select the species and then use information from Table 4 to determine the amount of each component. Table 4 provides a list of species. Select species from this list and the appropriate seeding rate to develop your seeding mixture.

All seed should be high quality and comply with Iowa Seed and Weed Laws. All seeding rates are expressed in Pure Live Seed (PLS) pounds per acre. PLS is calculated with the following equation PLS = (% germination + dormant seed X % purity) ÷ 100.

Seeding rates are based on the optimum amount of seed necessary to provide vegetative cover in a reasonable amount of time. The pure stand rates in Table 4 of this standard are the minimum rates for planting a single species stand into a well-prepared seedbed at the proper placement. The pure stand rates are decreased to a percentage of the desired stand, when used to calculate a mixture of two or more species. Mixtures are usually composed to provide about 50-75 or more seeds per square foot. Select combinations of plant species and cultivars best adapted to site conditions. Refer to Table 2 for forage use, Table 3 for site hazards and Table 7 for species compatibility when selecting species to be used for

seeding. Attention needs to be made to cultivar selection. Some cultivars within a species may have more resistance to disease or may be later maturing. Orchardgrass, for example, has some cultivars more resistant to rust and they have some cultivars that set a seed head later than other cultivars.

Approved, introduced and native plant species, allowable mixture compositions and pure stand seeding rates are shown in Table 4. A designed seeding mixture shall meet the criteria specified in Table 4. Seeding mixtures with wildlife as a secondary purpose should not have more than 10% of the mixture as tall fescue nor more than 20% as switchgrass. Native grass seedings can include up to 20% introduced legumes. However, legumes tend to establish much more quickly and can act as a "weed" to the native grass. So it might be preferable to interseed introduced legumes after the native grass has become established.

Tall fescue can be detrimental to grazing livestock, especially horses, if it is endophyte infected. The seed should be identified as to being "endophyte free" or "novel endophyte". If the seed tag does not say, assume the seed is endophyte infected. If tall fescue is going to be seeded it will, in most situations, be preferable to use the endophyte free or novel endophyte seed. While it is often beneficial to include several species in a seeding mix it is probably best to not include another grass in combination with tall fescue if grazing is the primary purpose. Because grazing animals don't prefer tall fescue as much as other grass the animals will selectively graze the other grass and leave the tall fescue which over time can result in nearly a solid stand of tall fescue. When seeding tall fescue it is good to include other forages but it probably best to achieve diversity by using legumes in the seeding mix.

To determine the seeding rate for a species when the producer is improving a stand versus establishing a new stand decide what percent of the stand the introduced species will comprise. Then use that percent of the full seeding rate for that species. For example if red clover is going to be interseeded into a bromegrass pasture and the producer would like to have 50% legume multiply 8# (full seeding rate of red clover) X 50% and the producer should seed 4#/acre of red clover, if he/she is frost seeding it would be 6#/acre.

Table 4. Seeding chart.

Plant Species	Legal wt per bu (lb)	Seeds per lb	Seeds/sq ft at 1 lb/Ac	Seeding Rate PLS pounds/acre[b] Alone	In Mixture
LEGUMES					
Alfalfa[a]	60	225,000	5.0	10-15	4-12
Alsike clover[a,b]	60	690,000	15.8	4-6	1-4
Birdsfoot trefoil[a]	60	380,000	8.7	5-8	2-5
Crownvetch[a]	60	120,000	2.8	8-15	5-10
Kura clover	---	---	5	8-10	---
Lespedeza (Korean)[a,c]	40	235,000	5.4	20-25	10-15
White (Ladino) clover[a,b]	60	800,000	18.4	1-3	1/4-1
Medium red clover[a]	60	275,000	6.3	8-12	4-8
Sweet clover[a,c]	60	260,000	6.0	8-15	4-8
INTRODUCED GRASSES					
Intermediate wheatgrass[b]	---	88,000	2.0	10-12	7-10
Kentucky bluegrass	14	2,177,000	50.0	5-10	4-6
Orchardgrass	14	654,000	15.0	8-12	4-6
Perennial ryegrass	---	275,000	6.3	15-20	5-10
Red top[b]	14	4,990,000	114.6	3-6	1-3
Reed canarygrass	46	530,000	12.2	8-12	4
Smooth bromegrass	14	136,000	3.1	10-16	4-10
Tall fescue	25	227,000	5.2	8-15	4-8
Timothy	45	1,200,000	27.5	4-8	2-4
NATIVE GRASSES					
Big bluestem	---	165,000	3.8	10-12	5-6
Canada wildrye	---	115,000	2.8	10	0.5-4.0
Eastern gamagrass[c]	---	7,500	2	10	---
Indiangrass	---	175,000	4.0	10-12	5-6
Little bluestem[b]	---	255,000	5.5	7-12	1-5
Sideoats grama[b]	---	191,000	4.4	9	2.5-5
Switchgrass[a]	---	389,000	8.9	5-7	3
ANNUAL GRASSES					
Pearl Millet	---	85,000	---	15 drilled, 30 broadcast	
Sudangrass	32	variable	---	25-30	---
Sorghum - sudangrass		variable		20-25 drilled, 30-35 broadcast	

a. Species suitable for frost seeding, increase seeding rate by a factor of 1.5.

b. Not recommended as a pure stand.

c. Use scarified seed.

Pounds of pure live seed (PLS). PLS%=(% Germination X % Purity)/100.

There may be other species available that have shown to be successful in a local area. These species can be used as a part of a mix if approved by the Area Resource Conservationist.

In Iowa, drainage is the most limiting factor for selection of forages. pH level is very important in establishing legumes. However, the affect of drainage, pH, and fertility on legumes will vary between legume species. Table 5 is a key to help select legumes to a specific site.

Table 5 Key for Selecting the Most suitable Legumes to Plant on Hay or Pasture Lands Differing in Soil Drainage, Fertility and pH level

Drainage Condition	Fertility Level	pH Level	Adapted Legumes (most to least desirable*)
Good Drainage	High Fertility	pH >6.5	Alfalfa, Red Clover, Trefoil, White Clover
		pH <6.5	Red Clover, Trefoil, White Clover
	Moderate Fertility	pH >6.5	Alfalfa, Red Clover, Trefoil, White Clover
		pH <6.5	Red Clover, Trefoil, White Clover
	Low Fertility	pH >6.5	Red Clover, Trefoil, White Clover
		pH <6.5	Red Clover, Trefoil, White Clover, Lespedeza*
Moderate Drainage	High Fertility	pH >6.5	Alfalfa, Red Clover, Trefoil, White Clover
		pH <6.5	Red Clover, Trefoil, White Clover, Lespedeza*
	Moderate Fertility	pH >6.5	Alfalfa, Red Clover, Trefoil, White Clover
		pH <6.5	Red Clover, Trefoil, White Clover, Lespedeza*
	Low Fertility	pH >6.5	Red Clover, Trefoil, White Clover, Lespedeza*
		pH <6.5	Trefoil, White Clover, Lespedeza
Poor Drainage	High Fertility	pH >6.5	Red Clover, Trefoil, White Clover
		pH <6.5	Red Clover, Trefoil, White Clover, Lespedeza*
	Moderate Fertility	pH >6.5	Red Clover, Trefoil, White Clover
		pH <6.5	Trefoil, White Clover, Lespedeza*
	Low Fertility	pH >6.5	Alsike Clover, Trefoil, White Clover, Lespedeza
		pH <6.5	Alsike Clover, Trefoil, White Clover, Lespedeza

* Lespedeza is generally adapted only to the lower tiers of counties in Iowa.

Most seedings will be a mixture of at least two species. Forage species planted in a mixture should exhibit similar palatability and mature at similar times to avoid spot or selective grazing. Table 7 shows forages that are compatible and Table 6 is a list of commonly used mixtures that research and experience have shown to be compatible.

Table 6 List of frequently used forage seed mixtures for specific site conditions and uses

Hay Crop Moderately to well drained Limed or nonacid, 6.6 – 7.3 pH. Fertile soils	Alfalfa	10-15 lbs/ac
	Alfalfa Smooth bromegrass or Orchardgrass or Reed canarygrass	8-10 lbs/ac 6-8 lbs/ac or 4-6 lbs/ac 6-8 lbs/ac
	Red Clover	10-12 lbs/ac
	Red clover or Kura clover Smooth bromegrass Orchardgrass or Timothy	8-10 lbs/ac 6-8 lbs/ac 3-4 lbs/ac 3-4 lbs/ac
Somewhat poorly drained, slightly acid soils, 6.1 – 6.5 pH	Alfalfa Red clover Smooth bromegrass or Orchardgrass or Reed canarygrass or Timothy	5-6 lbs/ac 3-4 lbs/ac 6-8 lbs/ac 4-6 lbs/ac 6-8 lbs/ac 3-4 lbs/ac
	Red clover Smooth bromegrass or Orchardgrass or Reed canarygrass or Timothy	6-8 lbs/ac 6-8 lbs/ac 4-6 lbs/ac 6-8 lbs/ac 3-4 lbs/ac
Poorly drained soils	Red clover Alsike clover Smooth bromegrass or Reed canarygrass or Timothy	5-7 lbs/ac 2 lbs/ac 6-8 lbs/ac 6-8 lbs/ac 3-4 lbs/ac
	Birdsfoot trefoil Timothy	5-6 lbs/ac 2-4 lbs/ac
	Reed canarygrass	8–12 lbs/ac
	Alsike clover Timothy or Red top or Reed canarygrass or Tall fescue	4 lbs/ac 4-5 lbs/ac 4 lbs/ac 6-8 lbs/ac 6-8 lbs/ac
Excessively Drained Soils	Alfalfa Smooth bromegrass or Orchardgrass or Tall fescue	8-10 lbs/ac 6-8 lbs/ac 4-6 lbs/ac 6-8 lbs/ac
Rotation and Permanent Pastures Moderately to well drained Limed or nonacid Fertile soils, 6.6 – 7.3 pH * Red clover at 4 lbs/ac can be substituted for ½ of the alfalfa seed or 6-8 lbs/ac red clover in place of alfalfa.	Alfalfa * Smooth bromegrass or Orchardgrass or Tall fescue	6-8 lbs/ac 6-8 lbs/ac or 4-6 lbs/ac 6-8 lbs/ac
	Alfalfa * Timothy Smooth bromegrass Orchardgrass	6-8 lbs/ac 2-4 lbs/ac 4-6 lbs/ac 3-4 lbs/ac
	Smooth bromegrass	15-20 lbs/ac

Somewhat poorly drained, slightly acid soils, 6.1 – 6.5 pH	Red clover White clover Orchardgrass or Tall fescue	6-8 lbs/ac ½ lbs/ac 4 lbs/ac 6-8 lbs/ac
	White clover Smooth bromegrass or Orchardgrass	½-1 lbs/ac 8-10 lbs/ac 6-8 lbs/ac
	Birdsfoot trefoil Smooth bromegrass	5 lbs/ac 6 lbs/ac
	Smooth bromegrass	15-20 lbs/ac
	Smooth bromegrass Orchardgrass	10 lbs/ac 4 lbs/ac
	Big bluestem	10-12 lbs/ac PLS
	Switchgrass	5-7 lbs/ac PLS
	Tall fescue	10-15 lbs/ac
Poorly drained soils	Birdsfoot trefoil Orchardgrass or Timothy	6 lbs/ac 5 lbs/ac 3-4 lbs/ac
	Alsike clover White clover Timothy or Tall fescue or Reed canarygrass	2-4 lbs/ac ½ lbs/ac 4 lbs/ac 8 lbs/ac 8 lbs/ac
	Tall fescue	10-15 lbs/ac
	Switchgrass	5-7 lbs/ac
	White clover Kentucky bluegrass	1-2 lbs/ac 6-8 lbs/ac
	Reed canarygrass	8 lbs/ac
Excessively Drained Soils	Smooth bromegrass	15-20 lbs/ac
	Alfalfa Smooth bromegrass or Orchardgrass or Tall fescue	6-8 lbs/ac 6-8 lbs/ac 4-6 lbs/ac 6-8 lbs/ac
	Tall fescue	10-15 lbs/ac
	Crownvetch Smooth bromegrass	8-10 lbs/ac 6-8 lbs/ac
Pasture for Horses	Alfalfa Kentucky bluegrass Smooth bromegrass or Orchardgrass	6-8 lbs/ac 2 lbs/ac 6-8 lbs/ac or 4-5 lbs/ac
	White clover Kentucky bluegrass Timothy or Smooth bromegrass or Orchardgrass	½ lbs/ac 3-5 lbs/ac 2-4 lbs/ac 6 lbs/ac 6 lbs/ac
	Birdsfoot trefoil Timothy	6 lbs/ac 2 lbs/ac
Pasture for Hogs	Alfalfa White clover	8 lbs/ac 2 lbs/ac
	Forage Rape Oats	4-6 lbs/ac 1-2 bu/ac

Supplemental Pasture	Sudangrass	25-30 lbs/ac
	Hybrid Pearl Millet	30-35 lbs/ac
	Oats	2-3 bu/ac
	Foxtail/German Millet	20-25 lbs/ac
	Winter rye (fall planted)	1 ½ bu/ac
	Forage Rape Oats	4-6 lbs/ac 1-2 bu/ac
Pasture for Goats	Red Clover Birdsfoot Trefoil Orchardgrass Tall Fescue	4-5 3-4 5 4-5
	Big Bluestem Indiangrass Little Bluestem (Could include native legumes and forbs, but don't use switchgrass.)	5 5 3

Table 7 Compatibility of Species Commonly Used for Pasture and Hayland Plantings in Iowa

	LEGUMES								C/S GRASSES									W/S GRASSES					
SPECIES	Alfalfa	Alskie Clover	An. Lespedeza	Birdsfoot Trefoil	Crownvetch	White Clover	Red Clover	Sweet Clover	Canada Wildrye	Kentucky Bluegrass	Orchardgrass	Redtop	Reed Canarygrass	Smooth Bromegrass	Tall Fescue	Timothy	Western Wheatgrass	Big Bluestem	Eastern Gamagrass	Indiangrass	Little Bluestem	Side-oats Gramma	Switchgrass
LEGUMES:																							
Alfalfa	G	F	F	G	P	G	F	G	F	P	G	P	F	G	F	G	F	F	F	F	F	F	F
Alskie Clover	F	G	F	F	P	F	G	F	G	G	G	G	F	G	G	G	F	P	F	P	P	P	F
An. Lespedeza	F	F	G	F	P	F	F	F	F	G	F	G	P	F	G	G	F	P	P	P	F	F	P
Birdsfoot Trefoil	G	F	F	G	F	G	F	G	F	F	G	F	P	G	G	G	F	G	G	G	G	G	G
Crownvetch	P	P	P	F	G	G	P	P	F	F	G	F	P	F	F	G	F	F	F	F	F	F	F
White Clover	G	F	F	G	F	G	G	G	F	G	G	G	F	G	G	G	F	F	F	F	F	F	F
Red Clover	F	G	F	F	P	G	G	F	F	G	G	G	F	G	G	G	F	P	P	P	P	P	P
Sweet Clover	G	F	F	F	P	G	F	G	G	G	F	G	P	F	F	F	G	F	F	F	F	F	F
COOL-SEASON GRASSES																							
Canada Wildrye	F	G	F	F	F	F	F	G	G	P	P	F	F	P	P	F	G	G	G	G	G	G	G
Kentucky Bluegrass	P	G	G	F	F	G	G	G	P	G	P	F	P	F	P	F	F	P	P	P	P	P	P
Orchardgrass	G	G	F	G	G	G	G	F	P	P	G	F	P	G	G	G	F	F	F	F	F	F	F
Redtop	P	G	G	F	F	G	G	G	F	F	F	G	P	F	F	F	F	G	G	G	G	G	G
Reed Canarygrass	F	F	P	P	P	F	F	P	F	P	P	P	G	P	P	P	P	P	P	P	P	P	P
Smooth Bromegrass	G	G	F	G	F	G	G	F	P	F	G	F	P	G	F	G	P	P	P	P	P	P	P
Tall Fescue	F	G	G	G	F	G	G	F	P	P	G	F	P	F	G	G	P	P	P	P	P	P	P
Timothy	G	G	G	G	G	G	G	F	F	F	G	F	P	G	G	G	F	G	G	G	F	F	G
Western Wheatgrass	F	F	F	F	F	F	F	G	G	F	F	F	P	P	P	F	G	G	G	G	G	G	G
WARM-SEASON GRASSES																							
Big Bluestem	F	P	P	G	F	F	P	F	G	P	F	G	P	P	P	G	G	G	G	G	G	G	G
Eastern Gamagrass	F	F	P	G	F	F	P	F	G	P	F	G	P	P	P	G	G	G	G	G	G	G	G
Indiangrass	F	P	P	G	F	F	P	F	G	P	F	G	P	P	P	G	G	G	G	G	G	G	G
Little Bluestem	F	P	F	G	F	F	P	F	G	P	F	G	P	P	P	F	G	G	G	G	G	G	G
Side-oats Gramma	F	P	F	G	F	F	P	F	G	P	F	G	P	P	P	F	G	G	G	G	G	G	G
Switchgrass	F	F	P	G	F	F	P	F	G	P	F	G	P	P	P	G	G	G	G	G	G	G	G

Good (G), Fair (F), Poor (P) – Species with Good (G) compatibility can be included in mixtures without restriction and should be the species of choice if they are also compatible with the pasture suitability group. If a species is Fair (F), it should make up no more than 25% of the mixture. Species with Poor (P) compatibility should not be planned in the planting.

Companion Crop

A companion crop can be used with any new seeding, especially if the site can not be adequately protected from erosion. It can be used with either spring or fall seeding. Oats and annual ryegrass will reduce soil erosion and also provide some weed control. If the oats will be harvested for grain the seeding rate can be increased to 2 1/2 bushels per acre. If the oats isn't harvested for grain they should be clipped at the time of seed head emergence. This promotes the growth of the new permanent cover. A companion crop is not required with frost seeding or interseeding and is optional for all other seeding periods.

Seedbed Preparation and Seeding

Conventional Seeding for spring and late summer seeding periods where site conditions allow for safe operation of equipment.

1. The seedbed shall be worked to a depth of three inches before seeding. It shall be reasonably smooth, friable and firm before seeding.
2. All tillage operations shall be performed across the general slope of the land
3. Grass and legume seed shall be drilled uniformly over the area at a 1/4-1/2 inch depth, or broadcast uniformly over the area and rolled into the seedbed.
4. Where erosion is a concern and conservation tillage is needed, prepare the seedbed with chisel, disk or similar tool that will leave enough residue to provide adequate protection and/or use a companion crop.

No-till Seeding for spring, late summer and dormant seeding periods where site conditions allow for safe operation of equipment.

1. Approved herbicides will be applied to kill or suppress existing vegetation and weed competition, as necessary.
2. A drill designed for no-till planting will be used to plant the seed at a depth of 1/4-1/2 inch.

Frost Seeding for late winter dormant seedings.

1. Broadcast seed for only those species approved for frost seeding as shown in Table 4.
2. Seeding rate will be increased by a factor of 1.5.

Seeding Stand Improvement

This includes any stand modification that maintains some vegetative component of the original stand. Often this will be incorporating more legumes into an existing stand of forage. This is typically done by either using a no-till drill to interseed grass or legumes, frost seeding by using a broadcast seeder, and incorporating the seed using some form of light tillage.

Regardless of the method used it will be beneficial to clip, graze or apply herbicides to suppress as much of the existing plant cover as possible. This will cause some stress to existing vegetation and make it less competitive. It will also make it easier to get good seed soil contact with the new seeding. In a pasture situation this can be accomplished by allowing the grazing animals, in the fall prior to seeding, to "overgraze" the area that will be seeded. If this wasn't accomplished in the fall the grazing animals could be placed in the area in the spring. However the quality of the existing forage will not be as good, and care must be taken so the grazing animals do not damage the seeding area due to soft ground.

No-till Interseeding can incorporate legumes and/or grasses during the spring, late summer and dormant seeding periods.

1. When seeding into an existing sod graze, burn, mow, or apply herbicides to suppress or kill strips of existing vegetation and control weed competition.
2. Broadleaf weeds can be controlled by grazing or applying herbicides at least 2 weeks prior to applying contact herbicides and prior to seeding. Be sure to check the label to insure this will not negatively affect legumes being interseeded.
3. Grasses and legumes shall be drilled uniformly over the area at 1/4-1/2 inch depth.
4. After seeding remove early spring growth of existing vegetation by mowing or grazing to reduce competition and allow the new seedlings access to sunlight so they can become established.

Frost Seeding to incorporate grass and/or legumes.

1. Broadcast seed only species approved for frost seeding as shown in Table 4. Small smooth (shiny) seeded species are best for incorporation into the soil during freezing and thawing.
2. Frost seeding is likely to be more successful if the existing stand is weak and the seed can get to open ground.

Light Tillage to incorporate grass and/or legumes.

1. Weaken the existing vegetation by grazing, mowing, herbicides, or a combination of these methods.
2. Use a disk, cultivator or similar tool to disturb 40-50 percent of the existing stand.
3. Grass and legumes shall be drilled uniformly over the entire area at 1/4-1/2 inch depth, or broadcast uniformly over the area and rolled into the seedbed.
4. Remove early spring growth of existing vegetation by mowing or grazing to reduce competition and allow the new seedlings access to sunlight so they can become established.

There are other methods to seed forages, especially if the producer is seeding into existing forage instead of establishing a new seeding. Producers have been successful including seed in a fertilizer spreader and combining the seeding and fertilizing process. However, if there is nitrogen included in the fertilizer this will result in giving extra growth to the existing grass which will provide more competition to any legumes that are trying to be established. Many producers have included legume seed with loose mineral they are giving the grazing animals. As the animals defecate they will deposit legume seed. This will work and if there are areas within a pasture that are not accessible with a seeder it might be the only way to get legumes introduced. However, the uniformity of legumes in the pasture will only be as uniform as the animals defecate in the pasture.

Weeds can be very competitive to a new seeding. The type of weeds and the composition of the new seeding help determine the choices available to control the weeds. Noxious weeds, such as Musk and Canada thistle, will often require a herbicide treatment. When using herbicides read and follow all label directions and heed all precautions. If herbicides are handled or applied improperly, or if unused portions are not disposed of safely, they may contaminate water and soil, injure humans, domestic, animals, desirable plants, and fish or other wildlife. Follow label directions when herbicides are used directly adjacent to ponds, lakes or streams. Cooperators should be aware of and adhere to the provisions of local, county, state or federal laws and regulations concerning the use of agricultural chemicals. Refer to Pest Management, Practice code 595 for additional information on pesticide use and safety. Herbicides are not a viable alternative if legumes are included in the seeding.

Other weeds can often be controlled by the grazing animals. Many weeds at a vegetative stage are edible by grazing animals and can be nutritious. Timely grazing in a rotational system can provide production to the producer during the seeding year and be a less expensive alternative for weed control than other methods. Care needs to be taken so that grazing animals do not damage the new seeding and it may not be a viable option with a new seeding of native forages.